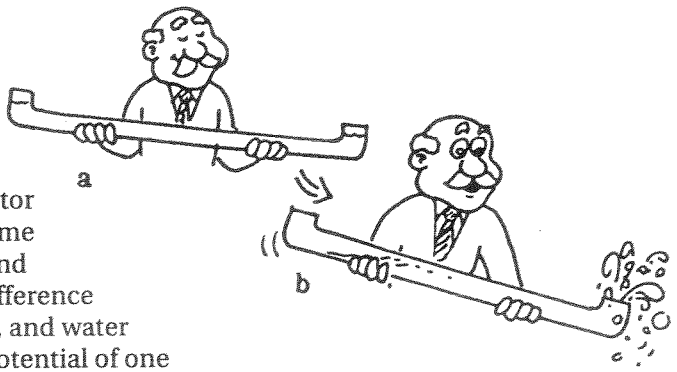
Name Period Date

Concept-Development Practice Page **34-1**

Electric Current

1. Water doesn't flow in the pipe when (a) both ends are at the same level. Another way of saying this is that water will not flow in the pipe when both ends have the same potential energy (PE). Similarly, charge will not flow in a conductor if both ends of the conductor are at the same electric potential. But tip the water pipe and increase the PE of one side so there is a difference in PE across the ends of the pipe, as in (b), and water will flow. Similarly, increase the electric potential of one end of an electric conductor so there is a potential difference across the ends, and charge will flow.

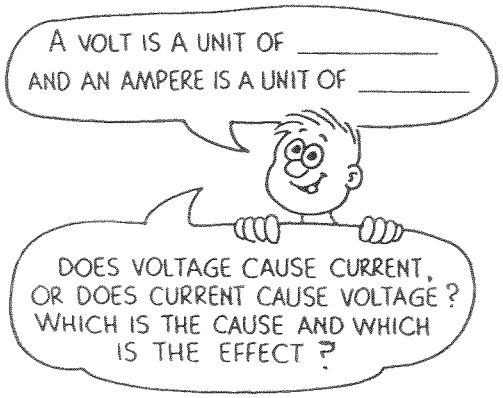


   a. The units of electric potential difference are
      (volts) (amperes) (ohms) (watts)

   b. It is common to call electric potential difference
      (voltage) (amperage) (wattage)

   c. The flow of electric charge is called electric
      (voltage) (current) (power),

      and is measured in
      (volts) (amperes) (ohms) (watts)



2. Complete the statements:

   a. A current of 1 ampere is a flow of charge at the rate of_____coulomb per second.
   b. When a charge of 15 C flows through any area in a circuit each second, the current is
      _____ A.

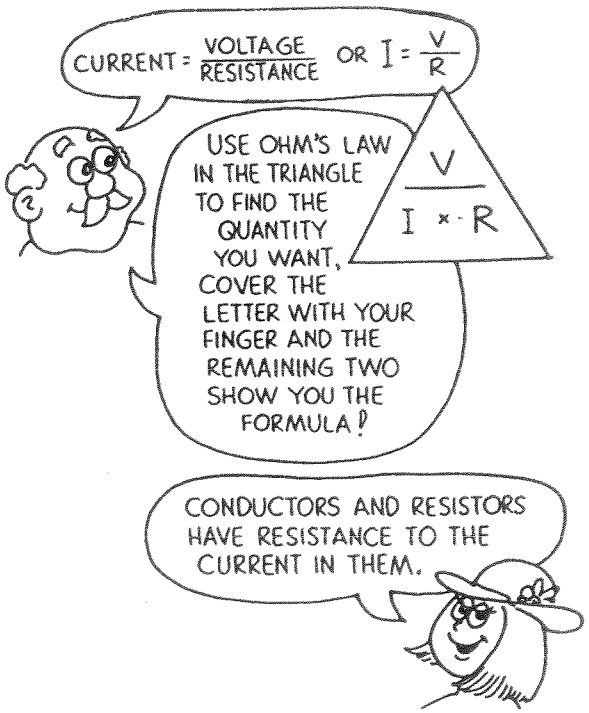
   c. One volt is the potential difference between two points if 1 joule of energy is needed to move
      _____coulomb of charge between the two points.

   d. When a lamp is plugged into a 120-V socket, each coulomb of charge that flows in the circuit is raised to a potential energy of _____ joules.

   e. Which offers more resistance to water flow, a wide pipe or a narrow pipe? _____
      Similarly, which offers more resistance to the flow of charge, a thick wire or a thin wire?
      _____

Conceptual PHYSICS

Ohm's Law



1. How much current flows in a 1000-ohm resistor when 1.5 volts are impressed across it?

   _____

2. If the filament resistance in an automobile headlamp is 3 ohms, how many amps does it draw when connected to a 12-volt battery?

   _____

3. The resistance of the side lights on an automobile are 10 ohms. How much current flows in them when connected to 12 volts?

   _____

4. What is the current in the 30-ohm heating coil of a coffee maker that operates on a 120-volt circuit?

   _____

5. During a lie detector test, a voltage of 6 V is impressed across two fingers. When a certain question is asked, the resistance between the fingers drops from 400 000 ohms to 200 000 ohms. What is the current (a) initially through the fingers, and (b) when the resistance between them drops?

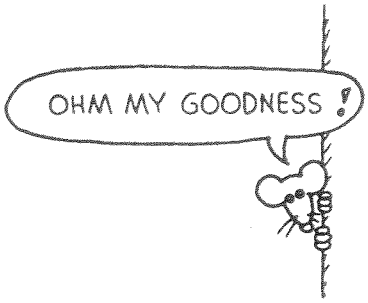
   (a) _____ (b) _____

6. How much resistance allows an impressed voltage of 6 V to produce a current of 0.006 A?

   _____

7. What is the resistance of a clothes iron that draws a current of 12 A at 120 V?

   _____



8. What is the voltage across a 100-ohm circuit element that draws a current of 1 A?

   _____

9. What voltage will produce 3 A through a 15-ohm resistor?

   _____

10. The current in an incandescent lamp is 0.5 A when connected to a 120-V circuit, and 0.2 A when connected to a 10-V source. Does the resistance of the lamp change in these cases? Explain your answer and defend it with numerical values.

    _____

    _____

Name Period Date

Concept-Development Practice Page 34-2

Electric Power

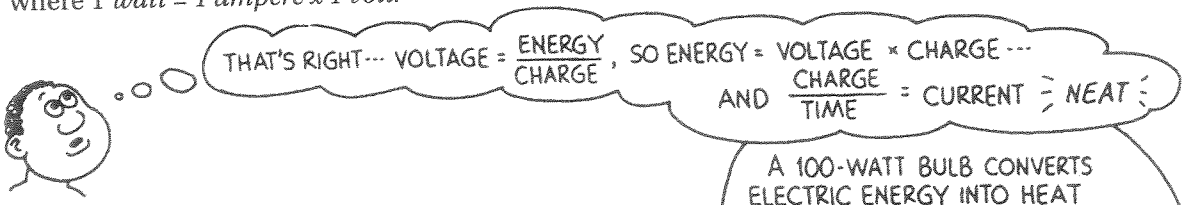
Recall that the rate energy is converted from one form to another is *power.*

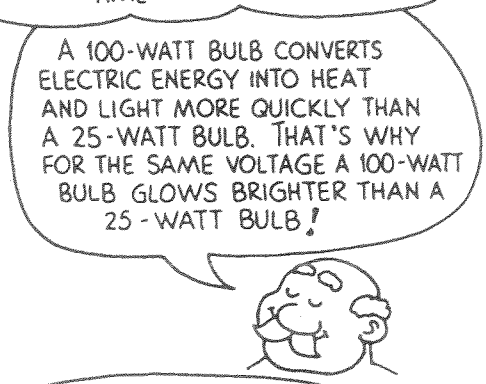
$$\text{power} = \frac{\text{energy converted}}{\text{time}} = \frac{\text{voltage} \times \text{charge}}{\text{time}} = \text{voltage} \times \frac{\text{charge}}{\text{time}} = \text{voltage} \times \text{current}$$

The unit of power is the *watt* (or *kilowatt*). So in units form,

Electric power (*watts*) = current (*amperes*) x voltage (*volts*),

where 1 *watt = 1 ampere x 1 volt.*





1. What is the power when a voltage of 120 V drives a 2-A current through a device?

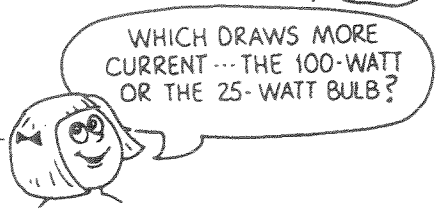
   _____

2. What is the current when a 60-W lamp is connected to 120 V?

   _____

3. How much current does a 100-W lamp draw when connected to 120 V?

   _____



4. If part of an electric circuit dissipates energy at 6 W when it draws a current of 3 A, what voltage is impressed across it?

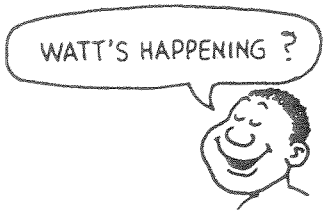
   _____

5. The equation

$$\text{power} = \frac{\text{energy converted}}{\text{time}}$$

   rearranged gives

   energy converted = _____



6. Explain the difference between a kilowatt and a kilowatt-hour.

   _____

7. One deterrent to burglary is to leave your front porch light on all the time. If your fixture contains a 60-W bulb at 120 V, and your local power utility sells energy at 8 cents per kilowatt-hour, how much will it cost to leave the bulb on for the whole month? Show your work on the other side of this page.

Conceptual PHYSICS